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यात्रियों के परिवहन के उद्देश्य से रोपवे के सभी प्रकार के डिजाइन और निर्माण के लिए स्वीकृति और प्रमाणन मापदंड

Acceptance and Certification Criteria for Design and Construction of All Types of Ropeways Intended for Transportation of Passengers

ICS 93.110

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भारतीय मानक ब्यूरो
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Continuous Bulk Conveying, Elevating, Hoisting, Aerial Ropeways and Related Equipment Sectional Committee, MED 06

FOREWORD

This Indian Standardwas adopted by the Bureau of Indian Standards, after the draft finalized by the Continuous Bulk Conveying, Elevating, Hoisting, Aerial Ropeways and Related Equipment Sectional Committee, had been approved by the Mechanical Engineering Divisional Council.

An aerial ropeway is a special form of transportation system where passengers/materials are carried on a tensioned wire rope supported above the ground. In ropeways handling passengers, safety, reliability, and conformance to high-quality and good industry practices are paramount for securing the safety of the users. Aerial ropeways are particularly useful in regions where the facility in surmounting natural barriers gives them a great advantage over railways or roads, both of which may need the heavy civil engineering work to secure easy gradient. They are inexpensive to maintain, pollution free, environment friendly, does not affect aesthetics, their power demand is modest and, they are not seriously affected by adverse climatic conditions.

Nothing in this standard is intended to contravene any provisions of the statutory regulations wherever they are in force.

Composition of the Panel-1 on 'Aerial Ropeways' of MED 06 responsible for the formulation of this standard is given at Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 :1960 'Rules for rounding off numerical values (*revised*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

ACCEPTANCE AND CERTIFICATION CRITERIA FOR DESIGN AND CONSTRUCTION OF ALL TYPES OF ROPEWAYS INTENDED FOR TRANSPORTATION OF PASSENGERS

1 SCOPE

1.1 This standard covers the acceptance and certification criteria for all types of ropeways intended for transportation of passengers.

1.2 This standard is intended with a view to technical acceptance of the ropeway with respect to design, construction and safety of passengers before putting to regular passenger transportation and subsequently monitoring its conformity once in a year mainly for safety of passengers to ensure that all safety measures are properly and efficiently functioning.

1.3 This standard is prepared with an acceptance criteria for all design of varying components depending upon the type of ropeway.

2 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

2.1 Ropeway — The system of overhead ropes on which carriers are suspended and hauled for the purpose of carriage of passengers, animals or goods and includes trestles, ropes, carrier, stations, offices, machinery and other works used for the purpose of or in connection with such aerial ropeway.

2.2 Inspecting Authority — Any competent authority recognized by the statutory regulations to inspect the aerial ropeways installation and determine its acceptability or otherwise, on the basis of this standard and compliance to prevailing statutory rules and regulations. If required, Competent Authority may hire external agencies like engineering institutions/ independent experts for carrying out said inspection.

2.3 Pre-commissioning Inspection — Basically covers all the operations required for confirming the readiness of the installation for acceptance and certification. Such inspection may be carried out by the purchaser or builder or by any third party.

2.4 Inspection — All of the operations intended for ascertaining and assessing the actual condition of an installation and its components.

2.5 Operational Inspection and Checks — Operations intended for verifying the good working condition of the installation before and during operation.

2.6 Operating Test — Operation for a specified duration, during which the correct working of the installation is tested.

2.7 Readiness for Acceptance — Condition of the installation where the functional and technical safety conditions for acceptance have been fulfilled.

2.8 Readiness for Operation — Condition of the installation where the functional and technical safety conditions to allow passengers to be transported have been fulfilled.

2.9 Applicability — This standard applies to all passenger ropeway installation along with the requirement of all other applicable Indian standards in force.

2.10 Worst Operating Conditions — Loaded cabins operating in the upward direction and empty cabins operating in the downward direction.

3 DESIGN, DOCUMENT CHECKING AND VERIFICATION

Design and document verification shall be carried out by the Inspecting Authority or purchaser or by any third party appointed by the purchaser. The verification shall encompass, but not limited to, the following:

a) Profile design (with all possible operating conditions) with load, power calculation, selection of bought out mechanical / electrical components, ropes;
b) Provision of rescue system under worst condition and corresponding arrangement in the cabin;
c) Establishment of ropeway capacity, cycle time;
d) The civil foundation design and drawing based on the load arising out of different operating condition;
e) The structural design and drawing based on the load arising out of different operating condition;

f) Electrically interlocked safety devices provided in line and station;
g) Conformity with all stipulations contained in applicable Indian standards;
h) Operation and maintenance manual; and
j) Earthing and lightening arrestor systems.

4 PRE-COMMISSIONING INSPECTION

4.1 Verification of conformity of the installation with the approved design and documents.

4.1.1 *Scope of verification shall include*

a) Verification of the conformity of the completed installation with the approved documents;
b) Checking of all test certificates/reports;
c) Checking the suitability of individual components (depending on type of installation), their operation with each other and within their local environment (*see* Annex A); and
d) Operating test reports as per Annex B;

4.2 Preparation of a report on the pre-commissioning inspection containing the following visual observations:

a) Physical condition of the station and line structures;
b) Free movement of the carriers or tow-hangers on the line and in the stations;
c) Availability of stipulated (in respective Indian standards) clearance of the carriers, tow-hangers and ropes in relation to other components and the station /line structure and fixed objects;
d) Attachment of the carriers or tow-hangers to the moving ropes and their resistance to slippage under all possible operating conditions;
e) Condition of the ropes, their splice joint(s) and end fixings;
f) Tensioning devices including the tensioning of the rope;
g) Rope guides and their proper operation;
h) Operation of the drive system under all the operating modes, including the operation of the control and adjustment devices, taking into account the most unfavourable operating conditions;
j) Performance of all the brakes individually under the most unfavourable loading and operating condition;
k) Operation of the safety and monitoring devices;
m) Generation of any abnormal sound, vibration, temperature rise etc;
n) Electrical installations including power supply system and system for dissipation of energy for regenerative power, if any;
p) Telecommunications and signaling installations; and
q) Safety measures and instructions for the passengers and operating staff in and around the stations.

NOTE — All pre-commissioning reports shall be signed and dated and made available to all concerned.

5 CONDUCTANCE OF PERFORMANCE TEST

5.1 If the installation satisfactorily passes the inspection in accordance with **4** then performance test shall be carried out as per Annex C.

5.2 The test should be carried out in presence by an authorized person from operator/builder and inspection Authority.

6 READINESS FOR ACCEPTANCE AND CERTIFICATION

Readiness for acceptance shall be achieved after adhering to the following:

a) Submission of documents as per **3**;
b) Pre-commission inspection as per **4**; and
c) Performance test as per **5**.

ANNEX A

[*Clause* 4.1.1 (c)]

Item	**Specification/Drawing**	**Test certificate/ Inspection Details**	**Compliance Yes/No**	**Acceptance Yes/No**
Main motor				
Main gearbox				
Control panel and drive				
Power supply system				
DG set				
Drive sheave assembly with shaft				
Service brake				
Emergency brake				
Earthing systems				
Telecommunication units				
Safety systems				
Cabin haulage drive				
Track rope				
Track rope brake				
Hauling rope				
Tensioning system				
Rope splicing details (certificate)				
Socketing details / certificate				
Cabins				
Carriage				
Grip				
Hanger				
Saddles				
Line sheaves				
Pedestals				
Mount beams				
Return sheave assembly with shafts				
Station sheaves				
Grip locking device				
Grip unlocking device				
Security items				
Air compressor				
Auxiliary drive motors				
Lightening protection system				

ANNEX B

[*Clause* 4.1.1(d)]

Step	**Activity during Trial** **(At Design Speed)**	**Minimum Duration**	**Remarks**
1.	Carry out individual trial run,for example, all brakes, motors, engines, generator, gear box, etc. (whichever is possible in detached condition)	2h continuous operation	Take corrective action, if abnormality is observed
2.	Run ropeway with empty rope and check ropeline alignment at sheaves of terminals and towers and record parameters with grid power supply and DG supply.–For example: a) Supply voltage, b) load current, c) Ropeway speed, d) Tension system movement; and e) Vibration and temperature at major equipments, for example,motor, gear box, drive sheave structure, towers and return station structure.	4 h continuous operation a day for 2 days	Rectify abnormalities, if any, and take further trial
3.	Run ropeway with rescue drive at empty rope with grid power supply and DG supply. Record ropeway parameters, for example: a) Supply voltage, b) Load current, and c) Ropeway speed.	2 h continuous operation	Rectify abnormalities, if any, and take further trial
4.	Run ropeway with 1 cabin/gondola/vehicle at grid power supply or DG supply. Record ropeway parameters, for example: a) Supply voltage, b) Load current, c) Ropeway speed, d) Tension system movement, and e) Vibration and temperature at major equipments, for example,motor, gear box, drive sheave structure, towers and return station structure.	2 h continuous operation	Rectify abnormalities, if any, and take further trial
5.	Run ropeway with 50 percent cabin/gondola/vehicle at grid power supply or DG supply. Record ropeway parameters, for example: a) Supply voltage, b) Load current, c) Ropeway speed, d) Tension system movement, and e) Vibration and temperature at major equipment’s, for example,motor, gear box, drive sheave structure, towers and return station structure.percent	4 h continuousoperation for 1 day	Rectify abnormalities, if any, and take further trial
6.	Run ropeway with 100 cabin/gondola/vehicle at grid power supply or DG supply. Record ropeway parameters, for example: a) Supply voltage, b) Load current, c) Ropeway speed, d) Tension system movement, and e) Vibration and temperature at major equipment’s,motor, gear box, drive sheave structure, towers and return station structure.	6 h continuous trouble free operation for 2 days	Rectify abnormalities, if any, and take further trial

Step	Activity during Trial (At Design Speed)	Minimum Duration	Remarks
7.	Run ropeway by rescue drive with 100 percent cabin/gondola/ vehicle at grid power supply or DG supply if it is electric motor driven. Record ropeway parameters, for example, a) Supply voltage, b) Load current, c) Ropeway speed, d) Tension system movement, and e) Vibration and temperature at major equipments,for example,motor, gear box, drive sheave structure, towers and return station structure. It the rescue drive is diesel engine driven the following parameters shall be recorded: a) Engine operation; b) Operation of gear drive; c) Vibration and temperature; and d) Exhaust from the engine.	2 h continuous operation	Rectify abnormalities, if any, and take further trial

ANNEX C

(*Clause* 5.1)

Step	Activity during Trial (At Design Speed)	Minimum Duration	Remarks
1.	Capacity test with all safety devices: Running the system with full load under worst condition of use at designed capacity	2 h continuous operation	
2.	Checking of all Rescue systems with full load condition under the worst condition of use: a) Rescue drive system; b) Vertical rescue, if applicable; and c) Separate rescue system as provided.	To be demonstrated once	

ANNEX D

(*Foreword*)

COMMITTEE COMPOSITION

Composition of the Panel-1 on 'Aerial Ropeways' MED 06

Organizations	*Representative(s)*
In Personal Capacity	Shri A. Bhadra (***Convener***)
In Personal Capacity	Shri C. K. Karmakar
In Personal Capacity, Kolkata	Shri Dwijendra Lal Das (*Invitee*)
CSIR-CIMFR, Dhanbad	Dr Debasish Basak
CRS, Pvt Ltd, Kolkata	Shri K. Bose
Damodar Ropeways & Infra Ltd, Kolkata	Shri Ranjan Mukherjee
Usha Breco Limited, Ghaziabad	Shri Manoj Panwar

Member Secretary

Shri A. K. Mohindroo
Scientist 'C' (MED), BIS

Bureau of Indian Standards

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